

Visualisation of flow over a rotating insect wing

A 12-credit-point Final Year Project for one student studying Mechanical or Aerospace Engineering

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Background

Flapping motion of an insect wing is characterised by its constant speed rotation followed by the flip motion during its half-stroke. Stable attachment of a leading-edge vortex (LEV) is a peculiar aspect of the flow over a rotating wing that makes the insect flight stable. The LEV has a three-dimensional structure for the wings with finite span. This project aims at studying the qualitative nature of the LEV structure for the wings with different geometrical parameters.

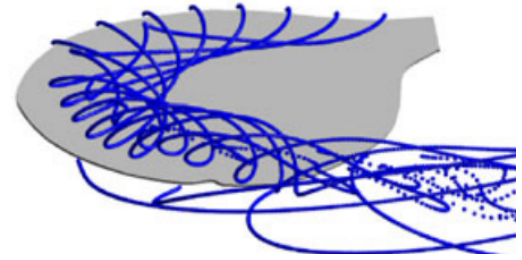


Figure 1: Leading edge vortex structure over a flapping wing of a fruit fly.
Image: Robert R. Harbig (2013).

Project description

In this experimental project, it is required to design and construct a mechanism for dye visualisation and perform experiments to visualise the LEV structure over a rotating insect wing planform. The experiments will be conducted in a water tank in the Water Channel Laboratory of FLAIR (www.flair.monash.edu.au). The flow structures will be observed and compared for insect wing models with different aspect ratios and rotational speeds.

Student requirements

This project will suit one student that has a strong understanding of fluid mechanics, competency with MATLAB, and basics of signal processing. The project will be 12 credit points.

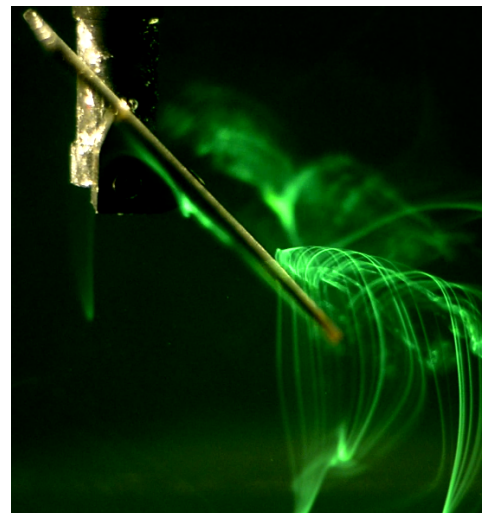


Figure 2: Dye visualization of the vortex structure